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09/103,873	06/24/1998	YOSHIHISA NAGANO	YAO-3950	3577

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EXAMINER

DIAZ, JOSE R

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 08/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/103,873

Applicant(s)

NAGANO ET AL.

Examiner

José R Díaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,6-10 and 29-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 33-34 is/are allowed.
- 6) ☒ Claim(s) 1,4,6-10 and 29-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

➤ A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 4, 2003 has been entered.

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

➤ Claims 1, 6, 10, 29 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Specification in view of White, Jr. et al. (US Pat. No. 6,130,102).

Regarding claims 1, 29 and 32, Applicant acknowledges a well-known semiconductor device (see Figures 10A-10E) comprising a ferroelectric capacitor (10) comprising a lower electrode (7), a dielectric film (8), and an upper electrode (9); a first insulating film (11) directly cover the capacitor; a first interconnect (14) selectively provided on the first interlayer insulating film (11) and electrically connected (12, 13) to

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the integrated circuit (2) and the capacitor (10) through a first contact hole (12) formed in the first interlayer insulating film (11); a second interlayer insulating film (15) provided so as to directly cover the first interconnect (14) and the first interlayer insulating film (11); a second interconnect (17) selectively provided on the second interlayer insulating film (15) and electrically connected (16) to the first interconnect (14) through a second contact hole (16) formed in the second interlayer insulating film (15); and a passivation layer (18) provided so as to cover the second interconnect (17) (see Figures 10A-10E). With regards to the limitation wherein the second interconnect is provided on the second interlayer insulating film so as to cover at least a part of the capacitor, Applicant acknowledges that the second interconnect layer is selectively formed on the second interlayer insulating film (see page 4, lines 1-2). Thus, the second interconnect layer is not restricted to be formed only on a specific area or portion of the second interlayer insulating film. But to the contrary, can be formed on any desired portion of the second interlayer insulating film. As an example, the Examiner cites the following references that show well known desired location for the formation of the second interconnect layer: Hanagasaki (US Pat. 5,767,541), specifically consider the second interconnect 5 in Figure 3, and Larson (US Pat. No. 5,580,814), specifically consider the second interconnect 40 in Figure 4F. Please note that both references formed the second interconnect layer above the ferroelectric capacitor, as required by the claim language.

However, Applicant states that Figures 10A-10E fail to teach the limitation of forming a second interlayer insulating film having a tensile stress. White, Jr. et al. discloses that it is well known in the art to form a second interlayer insulating film (44) of

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ozone-TEOS film directly over the first insulating film (42) (see Fig. 6, and col. 5, lines 66-67 and col. 6, lines 1-4). Please note that this ozone-TEOS film of White, Jr. et al. is the same material used by Applicant to provide the required tensile stress (see page 22, lines 6-14 of Applicant's Specification). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Applicant's Specification to include a second interlayer insulating film made of ozone TEOS for providing the required tensile stress. The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of improving the stress in the semiconductor device.

Regarding claims 6 and 10, Applicant is silent with respect to the materials selected to form the first and second interconnect layer. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the electrodes of such well known materials, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. In support of this assertion, the examiner cites the following references: Hanagasaki (US Pat. 5,767,541), specifically see col. 8, lines 48-56 and col. 10, lines 35-38, and Larson (US Pat. No. 5,580,814), specifically see col. 5, lines 55-67 and col. 6, lines 1-7, 20-27 and 41-53. Please note that both references formed the first and second interconnect layers from well-known materials such as refractory metals and aluminum.

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➤ Claims 1, 7-9 and 29-32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Specification in view of Matsuki et al. (US Patent No. 5,960,252).

Regarding claims 1, 29 and 32, Applicant acknowledges a well-known semiconductor device (see Figures 10A-10E) comprising a ferroelectric capacitor (10) comprising a lower electrode (7), a dielectric film (8), and an upper electrode (9); a first insulating film (11) directly cover the capacitor; a first interconnect (14) selectively provided on the first interlayer insulating film (11) and electrically connected (12, 13) to the integrated circuit (2) and the capacitor (10) through a first contact hole (12) formed in the first interlayer insulating film (11); a second interlayer insulating film (15) provided so as to directly cover the first interconnect (14) and the first interlayer insulating film (11); a second interconnect (17) selectively provided on the second interlayer insulating film (15) and electrically connected (16) to the first interconnect (14) through a second contact hole (16) formed in the second interlayer insulating film (15); and a passivation layer (18) provided so as to cover the second interconnect (17) (see Figures 10A-10E). With regards to the limitation wherein the second interconnect is provided on the second interlayer insulating film so as to cover at least a part of the capacitor, Applicant acknowledges that the second interconnect layer is selectively formed on the second interlayer insulating film (see page 4, lines 1-2). Thus, the second interconnect layer is not restricted to be formed only on a specific area or portion of the second interlayer insulating film. But to the contrary, can be formed on any desired portion of the second interlayer insulating film. As an example, the Examiner cites the following references

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that show well known desired location for the formation of the second interconnect layer: Hanagasaki (US Pat. 5,767,541), specifically consider the second interconnect 5 in Figure 3, and Larson (US Pat. No. 5,580,814), specifically consider the second interconnect 40 in Figure 4F. Please note that both references formed the second interconnect layer above the ferroelectric capacitor, as required by the claim language.

However, Applicant states that Figures 10A-10E fail to teach a second interlayer insulating film having a tensile stress. Matsuki et al, teach that is well known in the art to form the second insulating layers (21) of ozone TEOS material, which is subjected to a tensile stress (see col. 6, lines 45-50 and 55-59). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to modify Applicant's Specification to include first and second insulating layers having a tensile stress. The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of improving warp in the substrate and stress in the film applied from the substrate.

Regarding claims 7-9 and 30-31, Applicant does not teach a second interlayer insulating film having a tensile stress. As stated before, Matsuki et al, provide the general teaching of forming a thin insulating film having a tensile stress of 10^9 dyn/cm², a specific remnant of polarization of $\mu\text{C}/\text{cm}^2$ and a specific Si-OH bond absorption coefficient and (see Figs. 3A-3C, 7A-7C and col. 5, lines 47-48). Moreover, Applicant should note that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. Therefore, it would have been obvious

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to one having ordinary skill in the art at the same time the invention was made to modify Applicant's Specification to include first and second insulating layers having a tensile stress. The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of improving warp in the substrate and stress in the film applied from the substrate.

➤ Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Specification in view of White, Jr. et al. (US Pat. No. 6,130,102), and further in view of Matsuura et al. (US Pat. No. 5,132,774).

Regarding claim 4, a further different between the present invention and the prior art is the materials used to form the passivation layer. Matsuura et al. teaches that it is well known in the art to form the passivation layer of a laminate comprising silicon oxide and silicon nitride (see col. 7, lines 59-62). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the invention was made to further modify Applicant's Specification to include a passivation layer comprising a laminate including silicon oxide and silicon nitride. The ordinary artisan would have been motivated to modify Applicant's Specification in the manner described above for at least the purpose of isolating and protecting the exposed wiring layers.

Allowable Subject Matter

➤ Claims 33-34 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach, disclose, or suggest, either alone or in combination, a semiconductor device comprising a second interlayer insulating film having a tensile stress provided so as to directly cover the first interconnect, wherein the first interlayer insulating film and a second interconnect are selectively provided on the second interlayer insulating film and electrically connected to the first interconnect through a second contact hole formed in the second interlayer insulating film, and wherein a hydrogen supplying layer is provided between the first interconnect and the second interlayer insulating film excluding an area in which the capacitor is provided.

Response to Arguments

➤ Applicant's arguments with respect to claims 1, 4, 6-10, and 29-32 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

➤ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following reference forms an interconnect above a capacitor: Hayashi et al. (US Pat. No. 6,004,839), see Fig. 7G. And the following reference discloses the use of ozone TEOS (see reference signs 42 and 44 in Fig. 6).

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Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00-5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 746-3891 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
July 28, 2003



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